

II B.Tech I Semester Supplementary Examinations, November 2006
ELECTRO MECHANICS-I
(Electrical & Electronic Engineering)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain field energy and co-energy in the non-linear case.
(b) In a rectangular electromagnetic relay, the exciting coil has 1500 turns. Cross-sectional area of the core is $A = 5\text{cm} \times 5\text{cm}$. Neglect the reluctance of the magnetic circuit and fringing effects. Find the mechanical energy output when the armature moves such that the air-gap decreases from 1cm to 0.5 cm with coil current kept constant at 2 A. [6+10]
2. Draw the developed armature-winding diagram of a d. c. machine (showing commutator segments and position of brushes) with the following particulars: No. of slots = 13, no. of poles = 4, no. of conductors per slot = 2, type of winding simplex wave winding. [12+2+2]
3. (a) Explain the purpose of laminating the armature core of a d. c. machine.
(b) The diameter of a commutator ring of a lap wound d. c. motor is 25 cms. The brush width is 1.8 cm and width of mica insulation is 0.2 cm. If the speed of the motor is 200 rpm, determine the time of commutation. [6+10]
4. (a) What is critical speed? How do you calculate the critical speed in the laboratory?
(b) What are the conditions to build up of emf in a shunt generator? [8+8]
5. (a) Develop the general expression for the speed of a motor in terms of supply voltage, armature resistance and flux per pole.
(b) Discuss the applications of series motors and compound motors. [8+8]
6. (a) List out the various losses that occur in a d.c. machine and state how they vary with the load in case of a shunt motor.
(b) A 500 V series motor takes current of 180A to develop 80KW. The armature and series field resistances are 0.1Ω and 0.04Ω respectively. If the output is reduced to 40 KW, find the input current and efficiency. [8+8]
7. (a) What is the function of no volt release and overload release in a starter? Discuss the operation of these two features in a shunt motor starter.
(b) Explain with neat diagrams construction and working of a series motor starter. [8+8]
8. (a) Outline the steps to estimate the efficiency of given two d.c. machines by conducting Hopkinson's test. Draw schematic diagram to illustrate the method.

- (b) In a Hopkinson's test on a pair of 500V, 100KW, shunt generators, the following data was obtained. Auxiliary supply 30A at 500V
Generator output Current 200 A
Field currents 3.5 A and 1.8A
Armature circuit resistances of each machine 0.075Ω
Voltage drop at brushes (each machine) : 2 V
Calculate the efficiency of each machine acting as a generator. [8+8]
